

Remarks

Applicants respectfully request reconsideration of this application as amended herein.

Claims 1 and 5 have been rejected under 35 USC 102 as anticipated by Murakami et al (US 5,122,417). The Examiner's explanation of this rejection refers to Kimura et al, but the column and line references appear to correspond more closely to Murakami et al. Applicants will assume that reference to Kimura et al in this rejection is a typographical error and that Murakami et al was intended.

Murakami et al teach a pultrusion product having an axially-oriented layer of fibers and a helically wound layer of fiber, alternated repeatedly, drawn through a die to produce the desired cross-sectional shape, and cured. To prevent the helically wound fibers from being displaced during drawing, either or both axially-oriented or helically wound layers contain a separate fiber type of fluffed fiber to afford increased frictional resistance against displacement during travel through the die.

The Examiner states that Murakami discloses a hybrid composite flywheel rim. In fact, Murakami never mentions flywheel rims as a suitable application for his pultrusion process and, indeed, no person with any knowledge of the art would attempt to make a flywheel rim of pultruded fibers. The fibers in a pultruded article run axially and afford virtually no strength to the flywheel rim. Flywheel design using carbon and other fibers always is a wound structure. Murakami's process and the articles made thereby could never be used as a flywheel rim. Murakami is non-analogous art.

Even if Murakami were considered analogous art, his structure does not have a random distribution of fiber types amongst each other, wound in a band for fiber tows. His fibers are all carbon fiber except for a small percentage of fluffed glass or other fiber inserted for friction, not bands of fiber tows as claimed in amended claims 1 and 5.

The Examiner has declined to give any patentable weight to the limitation "wound in an annulus on a mandrel" on the ground that "the method of forming the device is not germane to the issue of patentability of the device itself." This is a repetition of a holding by the Examiner in the Office Action dated Dec. 19, 2002. Applicants requested in their Response dated March 19, 2003 that the Examiner provide the statutory basis

for this holding since Applicants can see no basis in law or logic for it. Indeed, "method or process limitations" in claims to devices are commonplace and routinely given patentable weight. Examples include "welded", "intermixed", ground in place", "etched", interbonded by interfusion", and "press fitted" (the latter found in US 6,247,382 to Umeki et al. issued by David A. Bucci). Applicants note that the limitation "helically wound around the axis" appears in claim 1 of U.S. 5,122,417 to Murakami et al., and the limitation "fiber and epoxy matrix wound into a substantially cylindrical configuration" appears in claim 1 of U.S. 4,370,899 to Swartout, the latter three patents all of record in this application. These are all "process limitations" in article claims that the PTO issued. Applicants respectfully renew their request to the Examiner to cite some authority for refusing to accord patentable weight to "wound in an annulus on a mandrel" in claim 1.

It should be noted that there are structural limitations inherent in the limitation "wound in an annulus on a mandrel". It implies that the fibers lie in a generally circumferential direction in which they can offer the greatest strength in the hoop direction, which is important to a structure used as a flywheel rim. This is in contrast to a pultruded article in which the fibers lie axially in the article.

Claim 7 has been rejected under 35 USC 102(a) as anticipated by Kimura. Kimura discloses a thick-walled cylindrical structural part of undisclosed use. He refers to a wall thickness of 40mm, which is not thick enough to make a flywheel with a respectable energy storage capacity.

The problem that Kimura addressed was interlayer separation produced by internal stresses caused by cooling the part from curing temperature to room temperature.

The Examiner asserts that Kimura discloses the claimed limitation in the rejected claims that the two fiber types are distributed randomly amongst each other. Applicants find no disclosure of this feature in the paragraph cited by the Examiner. In fact, Kimura is entirely silent on the problem that Applicants have identified and solved. Kimura is just as likely to encounter the unintended injurious radial alignment of fiber types as Applicants identified in their application as Applicants encountered, analyzed and solved. There is no disclosure in Kimura whatsoever of the problem or its solution that Applicants identified and solved. Accordingly, Applicants believe that claims 1 and 5-7

are patentable over Kimura, and respectfully solicit the Examiner's allowance of these claims over Kimura.

Kimura does not disclose a process as defined in claim 5, that will ensure that its fibers will be distributed randomly amongst each other and not become aligned radially in the undesirable condition identified and solved by Applicants.

Claim 6 has been rejected under 35 USC 103 as unpatentable over Murakami et al. The Examiner asserts that the following limitations in claim 6:

$$W_L = (N + B/A) \cdot L_R$$

$$W_L + L_R < L_m$$

N : Maximum integer obtained when W_L is divided by L_R

A : integer larger than B

B : integer smaller than A

$B/A \neq 1, 1/2, 1/3, 1/4$

W_L : Winding Length (inch)

L_R : Lead Rate (inch)

L_m : Distance between inner faces of two mandrel flanges (inch)

$$m \cdot L_R = n \cdot Sp$$

m : integer ≥ 2

n : integer ≥ 2

Sp : fiber space amongst other fiber (inch)

are obvious because it would have been obvious to one of ordinary skill in the art to "optimize the strength of the flywheel".

Of course, the general aim of "optimizing the strength of the flywheel" will always be a desirable objective in any flywheel design effort, but there is nothing in the prior art that would have made it obvious to one of ordinary skill in the art that the relationship defined in claim 6 would have "optimized the strength of the flywheel". The prior art of record does not show any recognition of the problem discovered by Applicants, so there would have been no inducement to make the invention, even if it would have been obvious.

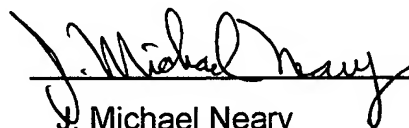
The Examiner explains further down on the page that "the winding length can be optimized through routine experimentation by changing the lead rate." The invention

has nothing to do with "optimizing the winding length." The winding length W_L is simply the traverse distance of fiber band center line between one end of the mandrel and the other end during winding. It does not need to be "optimized". It is basically merely the length of the mandrel. Changing the lead rate does not change the winding length. The invention is to select the lead rate in relation to the winding length to ensure that the fiber tows in the fiber band do not stack radially in successive layers in undesirable ways, as explained in detail in the specification. There is nothing whatsoever in the prior art of record that would suggest that this could be a problem or what form a solution might take.

Claim 7 calls for "macroscopically uniform distribution in each zone by controlling the correlation between lead rate of the fiber band as it is wound onto the mandrel per mandrel revolution and the winding length." Kimura does not disclose this structure or the problem of unintentionally failing to achieve it and the solution to ensure that the problem does not occur. Applicants have discovered the problem and have identified its cause and have solved it in a way to avoid it reliably. Claim 7 claims the structure by defining, in part, how the structure is arranged during its creation. There is nothing in the Patent Law that forbids Applicants from claiming their invention in this way. If the Examiner believes that this claim is unpatentable because the limitations in the claim must be ignored because they recite process distinctions, Applicant respectfully requests that a citation of the applicable provisions of the Patent Law be cited which specify that Applicants are not allowed to defined structure in terms of process limitations.

Applicants believe that the claims now pending in this application are patentable for the reasons set forth above and solicits the Examiner's reconsideration of these claims in light of these reasons. If the Examiner, in his independent judgement, concurs with Applicant's opinion, he is respectfully requested to pass this application to issue.

Respectfully submitted,



J. Michael Neary
Attorney for Applicants
Reg. No. 25,453

542 SW 298th Street
Federal Way, Washington 98023
voice: (253) 941-7683; fax: (253) 941-3623